
GROWTH AND DEVELOPMENT

VEGETATIVE GROWTH AND DEVELOPMENT

- Shoot and Root Systems
- Root functions
 - Anchor
 - Absorb
 - Conduct
 - Store

As the shoot system enlarges, the root system must also increase to meet demands of leaves/stems

MEASURING GROWTH

- Increase in fresh weight
 - Increase in dry weight
 - Volume
 - Length
 - Surface area
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MEASURING GROWTH

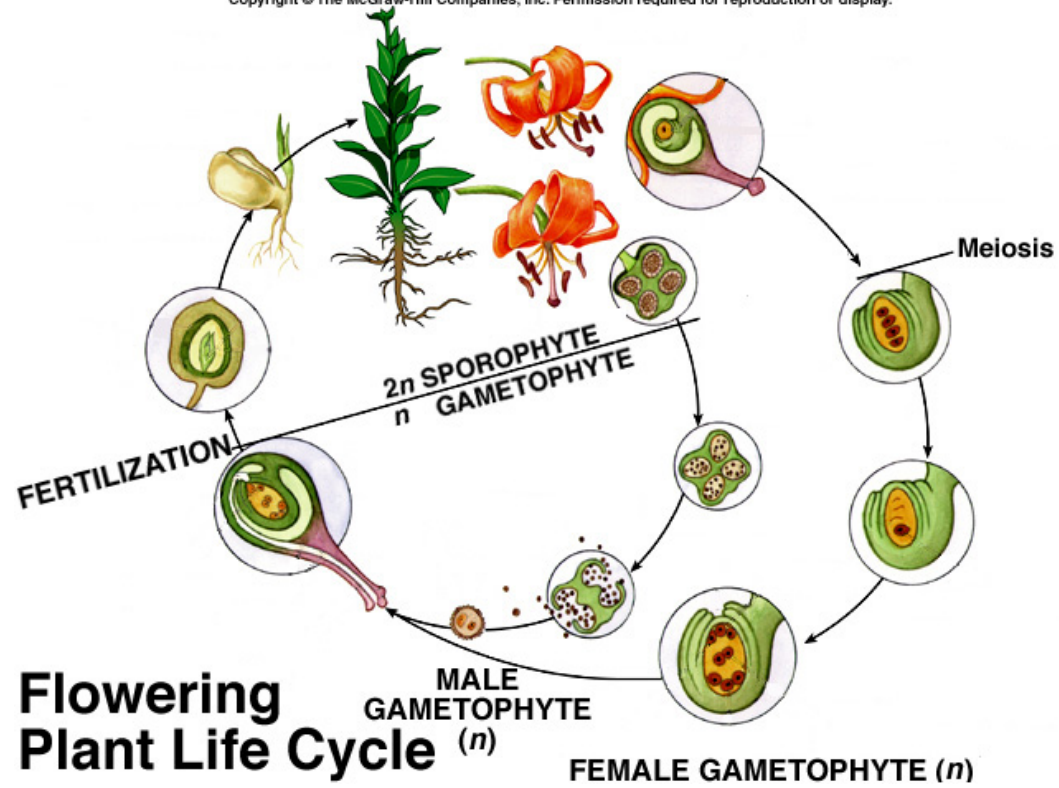
- Classifying shoot growth
 - **Determinate** – flower buds initiate terminally; shoot elongation stops; e.g. snap beans
 - **Indeterminate** – flower buds born laterally; shoot terminals remain vegetative;
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SHOOT GROWTH PATTERNS

- Annuals

- Herbaceous (nonwoody) plants
 - Complete life cycle in ***one growing season***
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SHOOT GROWTH PATTERNS

■ Biennials

- Herbaceous plants
 - Require ***two growing seasons*** to complete their life cycle (not necessarily two full years)
 - Stem growth limited during first growing season; see fig. 9-4; Note vegetative growth vs. flowering e.g. celery, beets, cabbage, Brussels sprouts
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SHOOT GROWTH PATTERNS

- Perennials

- Either herbaceous or woody
 - **Herbaceous** roots live indefinitely (shoots can)
 - Shoot growth resumes in spring from adventitious buds in crown
 - Many grown as annuals
 - **Woody** roots and shoots live indefinitely
 - Growth varies with annual environment and zone
 - Pronounced diurnal variation in shoot growth; night greater
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ROOT GROWTH PATTERNS

- Variation in pattern with species and season
 - Growth peaks in spring, late summer/early fall
 - Spring growth from previous year's foods
 - Fall growth from summer's accumulated foods
 - Some species roots grow during winter
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HOW PLANTS GROW

■ Meristems

□ Dicots

- Apical meristems – vegetative buds
 - shoot tips
 - axils of leaves
 - Cells divide/redivide by mitosis/cytokinesis
 - Cell division/elongation causes shoot growth
 - Similar meristematic cells at root tips
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HOW PLANTS GROW

- Meristems (cont)
 - Secondary growth in woody perennials
 - Increase in diameter
 - due to meristematic regions
 - vascular cambium
 - xylem to inside, phloem to outside
 - cork cambium
 - external to vascular cambium
 - produces cork in the bark layer
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GENETIC FACTORS AFFECTING GROWTH AND DEVELOPMENT

- DNA directs growth and differentiation
 - Enzymes catalyze biochemical reactions
 - Structural genes
 - Genes involved in protein synthesis
 - Operator genes
 - Regulate structural genes
 - Regulatory genes
 - Regulate operator genes
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